

Studies on Olividae. VII. Note on *Oliva dolicha* Locard, 1896, *O. flammulata* Lamarck, 1810 and *O. flammulata verdensis* Petuch & Sargent, 1986.

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**ABSTRACT.** The Cabo Verde representatives of *Oliva flammulata* Lamarck, 1810 are distinguished from the typical West African mainland specimens by small but significant differences in the protoconch. The name *O. flammulata dolicha* Locard, 1896 (*O. flammulata verdensis* Petuch & Sargent, 1986 is a junior synonym) applies to this insular population.

**RESUME.** *Oliva flammulata* Lamarck, 1810 des îles du Cap Vert se distingue de l'espèce typique de la côte Ouest-africaine par des différences petites mais significatives au niveau de la protoconque. Le nom *O. flammulata dolicha* Locard, 1896 (*O. flammulata verdensis* Petuch et Sargent, 1986 est un synonyme plus récent) s'applique à cette population insulaire.

**KEYWORDS:** Gastropoda, Olividae, *dolicha*, *flammulata*, *verdensis*, Cabo Verde Islands.

## 1. INTRODUCTION.

*Oliva flammulata* Lamarck, 1810 is the type species of the subgenus *Strephona* Mörch, 1852. It is the only representative of the genus *Oliva* on the West African continental coast, where it extends from Mauritania to Angola. It is known from the Mediterranean Miocene (BURNAY & DA CONCEICAO, 1983-84). BURCH & BURCH (1960) state that *O. ispidula* Born, 1787 is the same species. This would entail no nomenclatural change as the name is preoccupied by *O. ispidula* Linnaeus, 1758. Like many other Olive shells, *O. flammulata* is highly variable both in shape and in colour pattern. There seems to be a general consensus to consider the names *castanea*, *pallida* and *isabellina* all of Dautzenberg, 1910 as designating mere colour forms without taxonomic status.

The subspecies *O. flammulata verdensis* Petuch & Sargent, 1986 was created for the Cabo Verde representatives of the species. The original description offers the following differential diagnosis: "DISCUSSION: *O. flammulata verdensis* differs from typical *flammulata* by having an elongated, fusiform shape as compared to the cylindrical shape of the nominate subspecies. This new subspecies also has a higher, protracted spire and lacks the definite, rounded shoulder of typical *flammulata*". This population was not separated by BURNAY and DA CONCEICÃO (1983-84) in their detailed revision of the Olividae of Cabo Verde.

As far as we know the taxon *O. dolicha* Locard, 1897 is known only from a single undisputed specimen: the holotype deposited in the Muséum National d'Histoire Naturelle, Paris (MNHN). This specimen was dredged in deep waters off the Cabo Verde Islands. In the original description Locard

Fig.1 (opposite page). Scale 1/1. Illustration of representative specimens. First row: CABO VERDE (*O. flammulata verdensis*). 1: BT-2130. 2: BT-2135. 3: AB-101. 4: BT-2133. 5: BT-4650. Second row W.AFRICAN COAST (*O. flammulata*). 6: AB-105. 7: BT-2177. 8: BT-6027. 9: AB-106. 10: BT-6028. Third row : CABO VERDE (*Oliva dolicha*). 11: holotype (MNHN, Paris). Fourth row : CABO VERDE (*O. flammulata verdensis*). 12: BT-2132. 13: BT-2279. 14: BT-2134. 15: BT-2131. 16: BT-4651. Fifth row : W.AFRICAN COAST (*O. flammulata*). 17: AB-107. 18: BT-4874. 19: AB-108. 20: BT-2170. 21: BT-4873.

notes: "Par son galbe, comme par son mode d'ornementation, notre *Oliva dolicha* appartient au même groupe que l'*O. flammulata*; mais il s'en sépare: par son galbe beaucoup plus grêle, beaucoup plus étroitement effilé pour une même hauteur; par sa spire plus haute, plus amincie; par ses tours à croissance plus rapide et encore mieux distincts; par son dernier tour moins gros, moins ventru, par son encoche basale plus grande; par ses plis columel-

laires plus fortement accusés, etc ". Indeed, the holotype very much resembles a particularly elongated, juvenile *O. flammulata*.

Examination of large series of specimens suggested that the variability range of the Cabo Verde *O. flammulata* largely overlaps that of their mainland counterparts (see Fig. 1), prompting us to re-examine the situation, including the old problem of the status of *O. dolicha*.

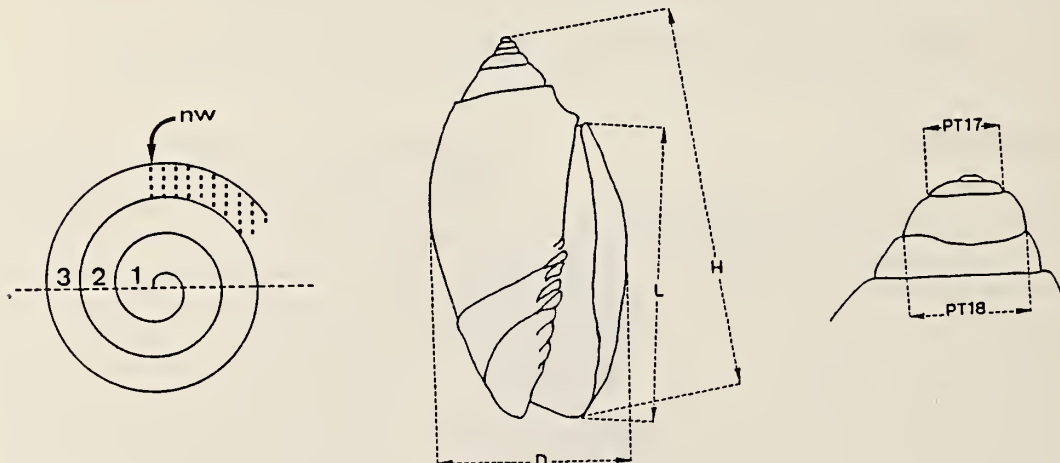


Fig. 2. Sketch of the measurements D, H, L, pt17, pt18 and nw (in this example nw = 3.25).



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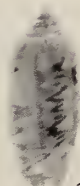
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## 2. METHODS.

We strongly feel that taxonomic decisions should not be a matter of personal inclinations and have elected to use a morphometric, easily verifiable approach based upon shell measurements. The shell measurements nw, pnw, spro, mpro, lpro, H, L, D, X, R, F and FG have been defined in detail in TURSCH & GERMAIN, 1985; res4, res5, res7 in TURSCH & GERMAIN, 1986; pt14, pt15, pt16, pt17 and pt18 in TURSCH & GERMAIN, 1987. For a quick reminder on the characters utilized for our conclusions, the meaning of the measurements L, D, H and the protoconch measurements pt17 and pt18 is illustrated in Fig. 2. nw is the number of volutions of the protoconch and can be determined to 0.05 whorl.

## 3. MATERIAL EXAMINED.

The measured specimens were selected at random, the only selection criterion being the presence of an intact protoconch (excepted for some specimens figured in Fig. 1). AB- refers to specimens from the A. Bossuyt collection (Wervik), DG- to specimens from the D. Greifeneder collection (Schwenningen) and BT- to specimens from the B. Tursch collection (Brussels). The sign (P-) indicates specimens with broken protoconch.

*Oliva flammulata* Lamarck, 1810.

ANGOLA: DG-1781-a (Mussulo Bay); AB-103 (Leandre); BT-4867, BT-4868, BT-4869, BT-4871, BT-4873 (P-), BT-4874, BT-4875, BT-4876 (no loc.). GABON: BT-2087, BT-2088 (Port Gentil). MAURITANIA: BT-4210, BT-4215 (La Awera). SENEGAL: BT-2127, BT-4432, BT-5751, BT-6027, BT-6028 (P-), AB-105, AB-106, AB-107, AB-108 (P-) (Dakar); BT-2177 (Hann Bay); BT-2170 (Gorée).

*Oliva flammulata verdensis* Petuch and Sargent, 1986.

CABO VERDE: DG-471, DG-1442-a, DG-1442-b, DG-1442-c, DG-2353-b, BT-1918, BT-2130 (P-), BT-2131, BT-2132, BT-2133, BT-2134, BT-2135 (P-), BT-2278, BT-2279, BT-4650, BT-5651 (P-), (all from the type locality: Porto Grande, Sao

Vicente I.); AB-100, AB-101 (Mindelo, Sao Vicente I.).

*Oliva dolicha* Locard, 1897.

CABO VERDE: Holotype MNHN, Paris ("Travailleur" dredging n° 109, depth 106-318 m).

## 4. RESULTS AND INTERPRETATION.

### 4.1. General observations.

Fig. 1 shows a series of Cabo Verde specimens (*O. flammulata verdensis*, most of them from the type locality), each one matched with an analogous specimen of *O. flammulata* from the mainland. The existence of important, constant differences in general aspect is not evident to us. The shape of *O. dolicha* appears different (more slender) and certainly deserves further investigation.

Fig. 3 shows the outline of protoconchs. Their great similarity suggests that all these shells are very closely related.

### 4.2. Evidence for a distinct Cabo Verde geographical race.

A computer-assisted search for characters that would allow objective separation of the Cabo Verde shells from typical mainland *O. flammulata* has been effected using the following 55 criteria: H/L, LW/L, D/L, X/L, R/L, (H-L)/L, (LW-L)/L, sut/L, sut/X, sut/R, F/L, FG/L, nw, spro, mpro, lpro, (lpro-spro)/nw, res4, res5, res7, pt14, pt15, pt16, pt17, pt18, res4/res5, res4/nw, res5/nw, pt14/pt17, pt14/pt18, pt14/res5, pt14/nw, (pt15+pt16)/pt16, pt16/pt18, pt16/pt17, pt16/res4, pt16/res5, pt16/nw, pt17/pt18, pt17/res4, pt17/res5, pt17/nw, pt18/res4, pt18/res5, pt18/nw, H/pnw, LW/pnw, D/pnw, X/pnw, R/pnw, (H-L)/pnw, (LW-L)/pnw, L/pnw, F/pnw, FG/pnw and pair combinations of these measurements.

Of all these, only nw provides a significant separation (see Table 1). Tests for pairs of characters have also been unsuccessful, unless they include nw.

Amongst the characteristics given for *O. flammulata verdensis* we cannot express "lack of rounded shoulder" and "fusiform" by convenient, simple measurements. The reader will have to make

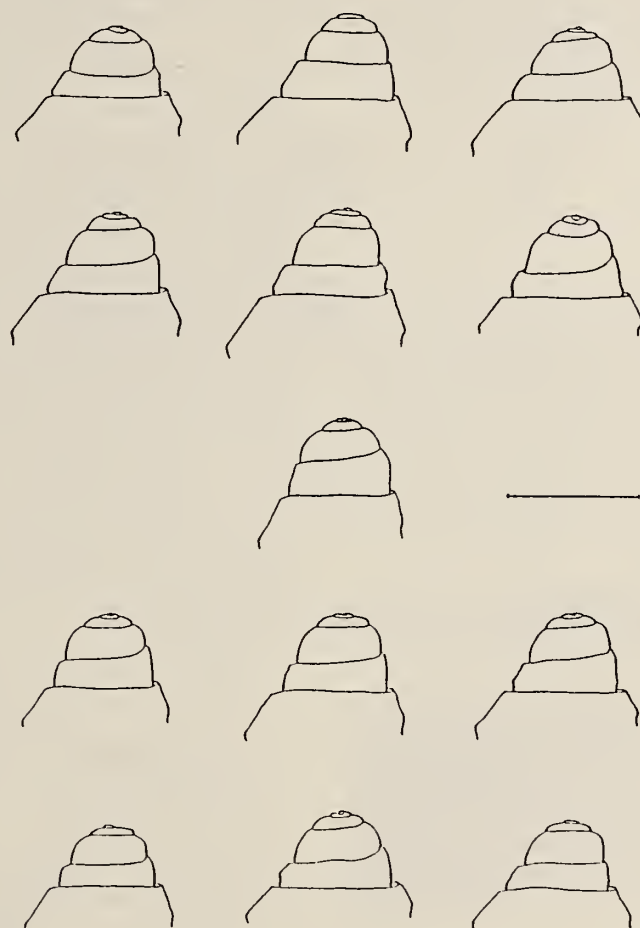


Fig 3. Outlines of protoconchs. The scale bar represents 1mm. First row: *O.flammulata*. From left to right, specimens AB-108, BT-6027, BT-4874. Second row: *O.flammulata*. From left to right, specimens AB-106, BT-5751, AB-107. Third row: *O.dolicha*. Fourth row: *O.flammulata verdensis*. From left to right, specimens BT-2134, BT-2132, AB-101. Fifth row: *O.flammulata verdensis*. From left to right, specimens BT-2279, BT-4650, BT-2131.

	Mean value	Standard deviation	95% Confidence interval	Variability coefficient
<b>nw</b>				
<i>O.flammulata</i>	4.50	0.105	4.29 - 4.71	2.33 %
<i>O.flammulata verdensis</i>	4.12	0.113	3.89 - 4.35	2.74 %
<i>O.dolicha</i>	4.10	-	-	-
<b>D/L</b>				
<i>O.flammulata</i>	0.56	0.022	0.52 - 0.61	3.82 %
<i>O.flammulata verdensis</i>	0.54	0.020	0.50 - 0.58	3.72 %
<i>O.dolicha</i>	0.51	-	-	-
<b>(H-L)/L</b>				
<i>O.flammulata</i>	0.25	0.079	0.10 - 0.41	30.86 %
<i>O.flammulata verdensis</i>	0.23	0.051	0.13 - 0.34	21.61 %
<i>O.dolicha</i>	0.36	-	-	-
<b>D/H</b>				
<i>O.flammulata</i>	0.45	0.018	0.41 - 0.49	3.95 %
<i>O.flammulata verdensis</i>	0.44	0.023	0.39 - 0.48	5.19 %
<i>O.dolicha</i>	0.37	-	-	-

Table 1. Selected numerical data.

*O.flammulata*: N=15; *O.flammulata verdensis*: N=16; *O.dolicha*: N=1.

his own judgement on these features (see Fig. 1). In contrast, "elongated shape" can be expressed by D/H or D/L. "Higher spire" can be measured by the character (H-L)/L. It can be seen from Table 1 that none of these characters provides a separation: the mean values as well as the variation ranges are nearly identical.

An example of total separation can be seen in Fig. 4 (scatter diagram of pt17/pt18 versus nw). On the face of such evidence one cannot escape the conclusion that a weakly separated insular subspecies occurs in the Cabo Verde region.

#### 4.3. The status of *O.dolicha*.

The only feasible approach is to determine whether or not the single specimen of *O.dolicha* is included within the variation limits of its shallow water Cabo Verde counterpart *O.flammulata verdensis*.

None of the protoconch characters (or pairs of these) provides any discrimination (as an example, see Fig. 4).

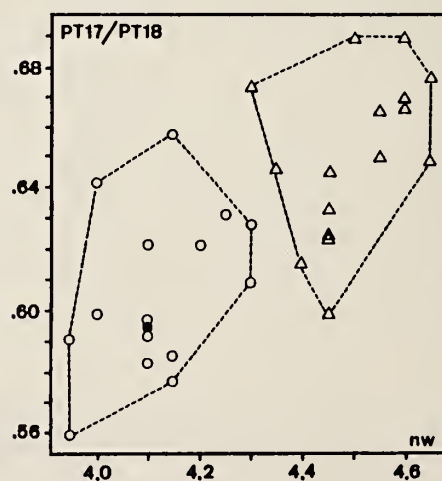


Fig. 4. Scatter diagram of pt17/pt18 versus nw. Minimum convex polygons. Open triangles: *O.flammulata*. Open circles: *O.flammulata verdensis*. Black circle: *O.dolicha*.



The "elongated" character can be expressed by the ratio D/H. The D/H ratio of the unique specimen of *O.dolicha* has a value of 0.37. This falls outside of the 99% confidence interval calculated for *O.flammulata* (0.40-0.50, n=16) and just at the limit of the 99% confidence interval calculated for *O.flammulata verdensis* (0.37-0.51, n=15).

The "elongation" of a shell is in fact constituted by the combination of D/L (the elongation of the last whorl) and (H-L)/L (the elongation of the spire). The D/L ratio of the type of *O.dolicha* has a value of 0.52, which is within the 95% confidence interval of *O.flammulata verdensis* (0.50-0.58, n=15, see Table 1). Its (H-L)/L ratio is 0.36. This is within the 95% confidence interval of *O.flammulata* (0.10-0.41, n=16, see Table 1) and the 99% confidence interval of *O.flammulata verdensis* (0.08-0.38, n=15). One will observe in Table 1 that the variability of the spire is much greater (22-31 %) than that of the other measurements (2-5 %): extreme values are not unexpected.

Fig. 5 shows the variation of the shell width D with the length of the lip L. It can be seen that *Oliva dolicha* is more "elongated" than the mean but fits

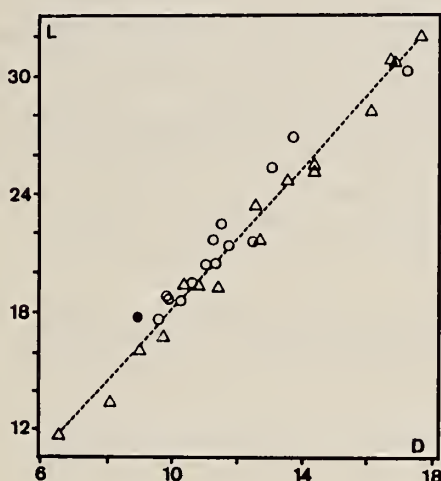


Fig. 5. Variation of the shell width (D) with the lip length (L), both in mm. Open triangles: *O.flammulata*. Open circles: *O.flammulata verdensis*. Black circle: *O.dolicha*.

well into the general growth pattern of the *flammulata* group. Its peculiar aspect comes from the fact that it has both an elongated spire and an elongated last whorl (both being within the variation limits of *O.flammulata verdensis*). As in addition, we cannot distinguish its protoconch from that of *O.flammulata verdensis*, the argument for separating the two taxa is quite unconvincing. One is thus compelled to conclude that *O.flammulata verdensis* Petuch and Sargent, 1986 is a junior synonym of *O.flammulata dolicha* Locard, 1896.

## 5. DISCUSSION.

The case of *O.flammulata verdensis* illustrates both the acuity of perception of experienced taxonomists and the dangers of using non-quantified (subjective) criteria. The morphometric approach is undoubtedly reductionist and incomplete: the authors must have seen (or sensed) characters or trends that we did not measure and they could not describe. In this case they were right for the wrong reasons (see section 4.2).

The feeling that the Cabo Verde shells are "elongated", "fusiform" and have a "higher, protracted spire" is probably due to the fact that the more "cylindrical" forms that commonly occur on the West African coast are not represented (or rare) in the archipelago. These forms are not figured in Fig. 1 but are represented in our random statistical sample of mainland *O.flammulata*. In other words, it would seem that most (all ?) shell shapes found in the Cabo Verde region have their mainland equivalent, but not the contrary.

The presence of a distinct subspecies in the Cabo Verde Islands is not surprising. These islands are quite separated from the African mainland and this is reflected by a high degree of endemism in some Mollusk families, as for instance in the Conidae (for a discussion on the analogous problem of larval dispersal from the West African coast to the Canary Islands, see BOUCHET, 1987, p.117-119).

The Cabo Verde subspecies *O.flammulata dolicha* can be safely recognized only by careful determination of the number of nuclear whorls nw. This situa-

tion is strikingly similar to that of *O.buelowi* Sowerby, 1888 where nw clearly separates the typical Melanesian species from the Andaman Sea subspecies *O.buelowi phuketensis* Tursch, Germain & Greifeneder, 1986.

None of our data suggests clinal variation of *O.flammulata* along the West African coast.

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